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1992/10/06

**Factors Relevant to a Comparison of
Launch Services**

I. Introduction

As provided by the Memorandum of Agreement Between the Government of the United States of America and the Government of the People's Republic of China Regarding International Trade in Commercial Launch Services (the MOA), delegations from the United States (U.S.) and People's Republic of China (PRC) met in Washington, D.C. on July 20-21, 1992, for consultations concerning compliance with the provisions of the MOA and developments in the international market for commercial launch services. In addition to these general topics, preliminary discussions took place regarding two PRC documents submitted prior to the consultations, entitled "Main Points on Comparable Prices of Launch Service" and "Reference Information Concerning the Comparable Commercial Launch Services Prices." The two documents contain information on PRC activities in the commercial launch market, in addition to proposed factors and approaches for comparing prices for commercial launch services. Although these discussions proved helpful in interpreting the documents and concurring on certain general principles, both parties generally agreed that a formal exchange of papers would greatly facilitate any further discussions on the comparable services issue.

Variations in price should be based on legitimate distinctions in service as identified by both the U.S. and the PRC. Accordingly, this paper provides the U.S. assessment of factors relevant to an evaluation of launch services and prices offered to customers in the commercial launch services market. It essentially represents a revised and more comprehensive version of a paper submitted by the U.S. in 1990, which contained, among other things, six points for comparing launch services. However, the objective of this exchange from the U.S. perspective is to reach agreement on those factors relevant to determining comparable launch services, so that such factors can be utilized in later assessments of PRC prices, terms, and conditions offered for commercial launch services in the international market.

Discussions regarding the related provisions of the MOA and specific PRC proposals on this issue are also included in this document for completeness.

II. Summary of Relevant Provisions of the MOA

For ease of reference, the central provisions of the MOA relative to the comparable services issue are contained in Article 2 (b) (ii), (iii) and (iv), which provide, in pertinent part, as follows:

(ii) The PRC shall require that its providers of commercial launch services offer and conclude any contracts to provide commercial launch services to international customers at prices, terms, and conditions which are on a par with those prices, terms, and conditions prevailing in the international market for comparable commercial launch services.

(iii) The PRC agrees that it will prevent its providers of commercial launch services from offering introductory or promotional prices for launch services except for the first or, in extraordinary circumstances, second successful commercial launch of a new launch vehicle. In this regard, promotional prices will not be offered for launches on the Long March IIE or III under any contract other than the contract for the successful launch of the Aussat B-1 and B-2 satellites.

(iv) The PRC agrees to require its launch service or insurance providers to offer international customers any insurance or reflight guarantees on a par with prevailing rates and practices in international markets for comparable risk.

In addition, paragraph 5 of the Annex to the MOA defines the term "prices, terms, and conditions" in Article 2 (b)(ii) as including, but not being limited to:

prices, financing terms and conditions and the schedule for progress payments offered to international customers by commercial launch service providers in market economies.

As indicated in prior discussions between the U.S. and the PRC, the obligation in Article 2 (b)(ii) regarding prices, terms, and conditions should be interpreted to mean that the conceptual basis for comparing prices, terms, and conditions for commercial launch services is established by prevailing trends in the international market. These trends are regularly clarified and substantiated through exchanges of market information in consultations and correspondence regarding the MOA. Any potential differences in prices, terms, or conditions for a given launch bid (or bids) due to valid, quantifiable differences in service should be viewed only as incremental adjustments to the basis established by competing bids in the international market.

III. Assessment of Proposed Factors for Comparing Launch Services

Various factors for determining comparable launch services have been proposed by the U.S. and the PRC on a preliminary basis through prior exchanges and discussions. A U.S. assessment of the significance or validity of these proposed factors and service elements is provided below, along with supporting discussions where applicable.

Intended Orbit

The ultimate orbit desired by a customer for a particular payload is clearly a significant distinguishing characteristic of a launch service, with the most commonly used orbits being suborbital, low earth orbit (LEO), geosynchronous transfer orbit (GTO), and geosynchronous orbit (GEO). One application of this factor would be a launch contract in which the payload manufacturer provided the kick motor for the orbital transfer phase of the mission, rather than the launch services provider. In this scenario, an incremental price difference might be justified, depending on other terms and services specified in the launch services contract.

Risk Management

As agreed in the July consultations, risk management is specifically addressed through the insurance provision contained in Article 2 (b) (iv) of the MOA. However, risk management provisions represent a significant element of the overall package of prices, terms, and conditions associated with commercial launch services, and as such are clearly related to the launch services price. In particular, legitimate, market-based distinctions in value (or cost to the customer) between different risk management packages can result in valid differences in the launch services price.

Launch Scheduling

In prior exchanges between the U.S. and the PRC, launch scheduling has been categorized as a relevant factor for comparing launch services. Scheduling issues in this context can pertain to either the reliability of the launch schedule offered by a particular launch provider or the availability of a launch for a given payload. It should be noted, however, that scheduling does not typically represent a primary element of service (such as vehicle lift capability or intended orbit) and should therefore have only a minor impact on price in most cases. An exception to this rule might exist in cases where the availability of a near term launch is specified in the launch services procurement process as a condition for winning the launch services contract. In either case, the China Great Wall Industry Corporation (CGWIC) does not appear to be at a disadvantage in terms of launch scheduling relative to U.S. commercial launch providers.

Payment Conditions and Terms

Payment conditions and terms are addressed through the provisions of Article 2 (b)(ii), which obligates PRC launch services providers to offer prices, terms, and conditions that are collectively "on a par" with those prevailing in the international market for comparable commercial launch services. Such conditions generally represent a significant element of the overall package of services offered to a launch customer. As such, legitimate, market-based distinctions in payment conditions or financing terms can be reflected in the launch services price, subject to the provisions of the MOA.

Vehicle Lift Capability

Vehicle lift capability to a particular orbit also represents an acceptable factor for comparing commercial launch services, although for ease of interpretation such comparisons should be based on general capability ranges (small, medium, intermediate, or large) only. In particular, this factor should be used to limit comparisons of launch services and prices to vehicles in the same capability range, rather than as a basis for incremental adjustments to the price for a given launch service.

For general reference, examples of small commercial launch vehicles include the Long March (LM) 1D, the U.S. Taurus (currently under development), or the larger LM-2C. The medium class includes such vehicles as the LM-3, the Delta II, and Ariane 40, while the intermediate class refers to vehicles such as the LM-2E/EPKM, the Atlas IIA, and the Ariane 44P. Examples of large commercial launch vehicles include the LM-3B, the Atlas IIAS, and the Ariane 44L.

Vehicle Reliability

As agreed in the July consultations, the service-related issues pertaining to new vehicle reliability are already addressed through the promotional price provisions contained in Article 2 (b)(iii) of the MOA. With regard to the relationship between price and the reliability of proven vehicles, any significant concerns regarding the reliability of a proven vehicle should be reflected in the value or cost of the risk management package, which is related to price in the manner described earlier.

Integration and Launch Support Requirements

As discussed in the July 1992 consultations, certain payload integration and/or launch support requirements may be acceptable in principle as factors for determining comparable launch services. Examples of launch support requirements might include payload shipping (and related transportation insurance), or measures necessary to prevent the transfer of certain technologies. Both of these examples involve a comparatively low level of expense.

With regard to integration (or interface) activities, valid distinctions in launch service can exist when a payload manufacturer is responsible for integrating the payload with the perigee propulsion system (such as a kick motor), or integrating the payload and perigee propulsion system with the launch vehicle. In such cases the price for the basic launch service could be justifiably lower by some incremental amount, since the customer would ultimately be paying the payload manufacturer for that portion of the service.

Despite the apparent validity of such requirements or service distinctions in principle, however, certain difficulties exist in terms of their application to a comparison of launch services. For example, payload transportation-related requirements are also a factor for U.S. and European providers of launch services. In that sense, such requirements may represent distinctions in service only to a limited degree. More importantly, the nature and degree of launch support-related requirements are often unclear to outside observers for a given launch services contract or bid, and no means for consistent, quantifiable evaluation has yet been established.

In view of such uncertainties and considerations, further information on the nature of the additional launch support and integration requirements proposed by the PRC as a factor for comparing launch services will be required before a final assessment can be completed.

Launch Inclination Effects

The U.S. government acknowledges the impact of higher latitudes on GEO launch capability, as well as the fact that the latitude of the Xichang launch site (28.2 degrees N) is higher than that of the Ariane launch facility at Kourou, French Guiana (5.2 degrees N). However, it should be noted that the latitude of Xichang is essentially the same as that of Cape Canaveral Air Force Station (28.5 degrees N) in the U.S., meaning that U.S. and PRC launch services providers use similar launch inclination angles for payload insertion into GTO. As a result, U.S. launch providers do not have a competitive advantage in terms of launch inclination.

Furthermore, it is the view of the U.S. government that the term "comparable launch services" in Article 2 (b)(ii) of the MOA was never intended to refer to this type of "service" distinction. For these reasons, launch inclination effects are not considered by the U.S. government as factors for determining comparable launch services.

Satellite Lifetime on Orbit

Satellite lifetime on orbit has been proposed in various

discussions between the U.S. and the PRC as a potential factor for comparing launch services, ostensibly on the basis of the direct and indirect relationships between launch inclination effects, orbital insertion accuracy, and the fuel available for the orbital operations of the satellite. In particular, the PRC has stated in these discussions that the high latitude of Xichang and the lower orbital insertion accuracy of PRC vehicles together justify a lower price for launches on PRC vehicles, since they result in a shorter lifetime and a loss of revenues for the satellite operator. As discussed above in the launch inclination section, however, any impacts on vehicle launch capability or satellite maneuvering life directly related to the launch inclination angle used by a launch provider are not considered by the U.S. government as factors for determining comparable launch services.

In terms of the effectiveness of PRC orbital insertion technologies, the successful results of the orbital insertion phase of the 1990 Asiasat launch suggest that PRC technologies for such applications are sufficient to meet current performance standards. Furthermore, according to statements by PRC officials in the July consultations, these technologies have recently been improved as part of the development of the third stage for the LM-3B launch vehicle. Such evidence indicates that the orbital insertion accuracy of PRC launch vehicles is not significantly lower than that of U.S. launch vehicles.

With regard to the economic aspects of the orbital lifetime issue, it is not clear that the orbital lifetime of a payload actually constitutes a significant factor in the customer decision-making process regarding a launch provider. For many payload operators, the usefulness of the later years of a satellite's available life on orbit is limited by the rapid rate of satellite technology development, and the related desire to utilize more capable and efficient satellite designs in a given orbital slot as currently operating satellite technologies become obsolete. This approach ostensibly enables the payload operator to maximize the number of services provided (and thus the revenue obtained) for a given satellite, depending on the demand for such services. It also addresses the uncertainties concerning the operational effectiveness and efficiency of a payload as it nears the end of its economic or design life. For all payload operators, moreover, the net present value of the revenues received in later years is quite low due to the well-established effect of the time-dependent value of money (as reflected in a discount rate). Consequently, the immediate impact on the price for launch services due to a projected loss of such revenues should in most cases not be significant, particularly for longer satellite lifetimes. Even if a payload operator considers the projected out-year revenues to be important, the impact on launch price should be far less than the projected value of those revenues.

In the absence of further information or justifications from the

PRC, therefore, the projected orbital lifetime of a satellite does not seem to represent in general a primary factor for determining comparable launch services or evaluating prices under the provisions of the MOA. Nevertheless, this factor may be significant in relation to the conditions of a particular launch procurement or bid and should be treated accordingly in such cases.

Annual Satellite Program Cost

With regard to the PRC proposal to evaluate launch services prices in terms of the annual cost for a satellite program, it should be noted that the MOA is exclusively oriented to price, rather than cost. In addition, the proposed formula confuses the pricing provision of Article 2 (b)(ii) by introducing other variables that would be highly subject to interpretation, as well as difficult to implement on a consistent basis.

Due to these considerations, the U.S. government strongly believes that the provisions of Article 2 (b)(ii) should continue to be interpreted strictly in terms of the obligation to provide launch services prices, terms, and conditions that are on a par with those prices, terms, and conditions prevailing in the international market for comparable launch services.

IV. Conclusion

As a general summary of the discussions provided above, it is the view of the U.S. government that the intended orbit for a payload, vehicle lift capability, launch scheduling, payment conditions and terms, and risk management approaches represent significant factors in principle for comparing launch services and evaluating prices in the commercial launch services market, subject to the stipulations and qualifications described previously. As discussed earlier, satellite lifetime on orbit may be relevant in certain cases but does not appear to be a significant factor in general. Requirements related to integration and/or launch support may also be acceptable in principle, but will require further information and analysis before a final determination can be made.

With regard to the other PRC proposals, issues relating to vehicle reliability are addressed through the introductory price and risk management provisions of the MOA and should therefore not be included as new or unique factors for comparing launch services. For the reasons provided earlier, launch inclination effects and annual satellite program costs are not considered relevant as significant factors for determining comparable launch services.